

In the Claims:

1. (Original) A method of providing an interface to a data storage system, the method comprising the steps of:

defining parameters of a volume within the data storage system having a plurality of storage devices;

creating, in the data storage system, the volume from the parameters when there are storage devices associated with the volume, and when there are no storage devices associated with the volume;

providing the volume as an area of available data storage space in the data storage system to a computing device which is external to the data storage system, the volume of storage accessible with an associated identifier, wherein the area of available data storage space provided as the volume to the computing device is greater than an actual area of available data storage space provided by actual storage devices associated with the volume;

receiving, from the computing device which is external to the data storage system, a request for access, via the associated identifier, to the volume, the computing device providing the request requiring an amount of data storage in the volume that is greater than the actual area of available data storage space provided by actual storage devices associated with the volume; and

responding to the request in a manner that satisfies proper operation of the request in the computing device providing the request such that the computing device providing the request perceives that the amount of data storage in the volume is greater than the actual area of available data storage space provided by actual storage devices associated with the volume.

2. (New) A method of facilitating access to a storage system, the method comprising:

utilizing a volume interface to provide at least one computer access to a volume in the storage system, the storage system including multiple storage devices for storing the volume;

setting parameters in the volume interface to define attributes associated with the volume;

while the volume is mounted by the at least one computer, reconfiguring the volume; and

via the volume interface, providing the at least one computer access to the reconfigured volume.

3. (New) A method as in claim 2, wherein providing access to the reconfigured volume includes enabling the at least one computer to access the reconfigured volume without having to reboot corresponding operating systems in the at least one computer.

4. (New) A method as in claim 2 further comprising:

via the volume interface, providing multiple computers running different operating systems access to the volume; and

maintaining computer-specific access information in the volume for each of the multiple computers, the computer-specific access information including access information required by the different operating systems to access data stored in the volume.

5. (New) A method as in claim 2 further comprising:

providing multiple computers access to multiple volumes in the storage system;

maintaining a set of parameters for each of the multiple volumes;

utilizing a first parameter to track a corresponding size associated with a given volume of the multiple volumes; and

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providing an appearance to the at least one computer that the corresponding size of the given volume is greater than zero even though there are no corresponding storage devices in the storage system associated with the given volume.

6. (New) A method as in claim 2 further comprising:

providing multiple computers access to multiple volumes in the storage system;

maintaining a set of parameters for each of the multiple volumes, the parameters defining attributes of the multiple volumes; and for a given volume of the multiple volumes: i) utilizing a first parameter in a corresponding set of the parameters to track a corresponding size associated with the given volume, and ii) providing an appearance to the multiple computers that the corresponding size of the given volume is greater than zero even though there are no corresponding storage devices in the storage system associated with the given volume.

7. (New) A method as in claim 2 further comprising:

providing multiple computers access to multiple volumes in the storage system;

maintaining parameters for the multiple volumes, the parameters defining attributes of the multiple volumes;

for a first volume of the multiple volumes: i) selecting a size associated with the first volume, the size associated with the first volume reflecting an actual amount of storage associated with the first volume; and

for a second volume of the multiple volumes: i) selecting a size associated with the second volume, the size associated with the second volume being different than an amount of storage space actually associated with the second volume.

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8. (New) A method as in claim 7 further comprising:  
for a third volume of the multiple volumes: maintaining an appearance that the third volume exists even though there is no storage space allocated in the storage system for storing data associated with the third volume.
9. (New) A method as in claim 8 further comprising:  
for the third volume of the multiple volumes: selecting a size associated with the third volume, the size associated with the third volume being greater than an amount of storage space actually associated with the third volume.
10. (New) A method as in claim 2, wherein reconfiguring the volume includes modifying a size parameter identifying available storage space in the storage system associated with the volume; and wherein the reconfiguring occurs in response to detecting a request to access the storage system and the request requires that the volume be of a minimum size so that the access can be carried out.
11. (New) A method of providing at least one computer access to a volume in a storage system, the method comprising:  
utilizing a volume interface to enable the at least one computer to access the volume in the storage system;  
via the volume interface, keeping track of a corresponding size associated with the volume as well as corresponding storage devices in the storage system associated with the volume; and  
providing an appearance to the at least one computer that the corresponding size of the volume is different than an amount of storage space actually provided by the corresponding storage devices in the storage system associated with the volume.

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12. (New) A method as in claim 11, wherein providing the appearance includes providing the appearance to the at least one computer that the size of the volume is larger than the amount of storage space actually provided by the corresponding storage devices in the storage system which are associated with the volume.

13. (New) A method as in claim 11 further comprising:  
without interrupting an application executed by the at least one computer, allocating more storage space in the storage system to the volume as the application executed by at least one computer consumes the amount of storage space in the storage system actually associated with the volume.

14. (New) A method as in claim 13, wherein allocating more storage space to the volume occurs in response to detecting that an available amount of free storage space associated with the volume crosses a threshold.

15. (New) A method as in claim 11 further comprising:  
for different usage periods, modifying the amount of storage space actually provided by the corresponding storage devices in the storage system associated with the volume in response to a usage trend analysis.

16. (New) A method as in claim 15 further comprising:  
maintaining the corresponding size associated with the volume to be a substantially fixed amount more than an actual amount of storage associated with the volume.

17. (New) A method as in claim 15 further comprising:  
providing write overflow protection to the volume by maintaining the corresponding size associated with the volume to be less than an actual amount of storage space in the storage system associated with the volume.

18. (New) A method as in claim 17 further comprising:

in response to detecting that the volume stores more data than indicated by the corresponding size associated with the volume, initiating a reconfiguration process to add more storage space in the storage system for use by the volume.

19. (New) A method of providing at least one computer access to a storage system, the method comprising:

maintaining a plurality of parameters associated with a volume in the storage system;

utilizing a first parameter of the plurality of parameters to track a corresponding size associated with the volume; and

providing an appearance to the at least one computer that the corresponding size of the volume is greater than zero even though there is no storage space in the storage system associated with the volume.

20. (New) A method as in claim 19, wherein providing the appearance includes:

providing the appearance during times when the at least one computer does not require access to any data stored in the volume.

21. (New) A method of providing access to a storage system, the method comprising:

maintaining a plurality of parameters associated with a volume in the storage system;

utilizing a first parameter of the plurality of parameters to track a corresponding size associated with the volume and a second parameter to track corresponding storage devices in the storage system associated with the volume; and

via use of the first parameter and second parameter, providing an appearance to a set of computers that the corresponding size of the volume is zero while, simultaneously, there is no storage space and no storage devices in the storage system associated with the volume.

22. (New) A method as in claim 21, wherein providing the appearance includes:

providing the appearance to the set of computers while a given computer running a backup application has access to the volume stored in the storage system.

23. (New) A method as in claim 22 further comprising:

during periods when the backup application in the given computer is not in use, modifying the second parameter to remove, from the volume, associations to storage devices in the storage system.

24. (New) A method as in claim 22 further comprising:

during a time when the back-up application in the given computer is in use, modifying the second parameter to add, to the volume, associations to storage devices in the storage system.

25. (New) A method as in claim 24 further comprising:

varying an amount of storage space associated with the backup volume during times when the backup volume is in use, the amount of storage space varying depending on portions of the storage system to be backed up.

26. (New) A method as in claim 21 further comprising:

to support utilizing the volume as a backup volume, coordinating with a backup application executing on a given computer of the set of computers to:

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- a.) via modifications to the second parameter, associate portions of storage space from the storage system to the volume;
- b.) enable the backup application to backup the volume to another storage system; and
- c.) via modifications to the second parameter, disassociate the portions of storage space in the storage system from the volume.

27. (New) A method as in claim 26 further comprising:  
repeating steps a, b, and c to support backup of each of multiple, different portions of storage space in the storage system.

28. (New) A method of supporting access to a storage system, the method comprising:

    providing multiple computers access to multiple volumes in the storage system;

    maintaining parameters defining attributes of the multiple volumes in the storage system;

    for a first volume of the multiple volumes: utilizing a size parameter associated with the first volume to reflect an actual amount of storage associated with the first volume; and

    for a second volume of the multiple volumes: utilizing a size parameter associated with the second volume, the size parameter associated with the second volume being different than an amount of storage space actually associated with the second volume.

29. (New) A method as in claim 28 further comprising:

    reconfiguring the second volume by modifying the size parameter associated with the second volume; and

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wherein the reconfiguring occurs in response to detecting a request to access the second volume and the request requires that the volume be of a minimum size so that the access can be carried out.

30. (New) An interface supporting access to a storage system, the interface comprising:

a processor;

a memory unit that stores instructions associated with an application executed by the processor, the processor supporting operations of:

utilizing a volume interface to provide at least one computer access to a volume in the storage system, the storage system including multiple storage devices for storing the volume;

setting parameters in the volume interface to define attributes associated with the volume;

while the volume is mounted by the at least one computer, reconfiguring the volume; and

via the volume interface, providing the at least one computer access to the reconfigured volume.

31. (New) An interface as in claim 30, wherein providing access to the reconfigured volume includes enabling the at least one computer to access the reconfigured volume without having to reboot corresponding operating systems in the at least one computer.

32. (New) An interface as in claim 30 further supporting operations of:

providing a continued perception to the at least one computer mounting the volume that the volume exists before, during, and after reconfiguration of the volume.

33. (New) An interface as in claim 30 further supporting operations of:

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via the volume interface, providing multiple computers running different operating systems access to the volume; and

maintaining computer-specific access information in the volume for each of the multiple computers, the computer-specific access information including access information required by the different operating systems to access data stored in the volume.

34. (New) An interface as in claim 30 further supporting operations of:

providing multiple computers access to multiple volumes in the storage system;

maintaining a set of parameters for each of the multiple volumes;

utilizing a first parameter to track a corresponding size associated with a given volume of the multiple volumes; and

providing an appearance to the at least one computer that the corresponding size of the given volume is greater than zero even though there are no corresponding storage devices in the storage system associated with the given volume.

35. (New) An interface as in claim 30 further supporting operations of:

providing multiple computers access to multiple volumes in the storage system;

maintaining a set of parameters for each of the multiple volumes, the parameters defining attributes of the multiple volumes; and

for a given volume of the multiple volumes: i) utilizing a first parameter in a corresponding set of the parameters to track a corresponding size associated with the given volume, and ii) providing an appearance to the multiple computers that the corresponding size of the given volume is greater than zero even though there are no corresponding storage devices in the storage system associated with the given volume.

36. (New) An interface as in claim 30 further supporting operations of:

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providing multiple computers access to multiple volumes in the storage system;

maintaining parameters for the multiple volumes, the parameters defining attributes of the multiple volumes;

for a first volume of the multiple volumes: i) selecting a size associated with the first volume, the size associated with the first volume reflecting an actual amount of storage associated with the first volume; and

for a second volume of the multiple volumes: i) selecting a size associated with the second volume, the size associated with the second volume being different than an amount of storage space actually associated with the second volume.

37. (New) An interface as in claim 36 further supporting operations of:

for a third volume of the multiple volumes: maintaining an appearance that the third volume exists even though there is no storage space allocated in the storage system for storing data associated with the third volume.

38. (New) An interface as in claim 37 further supporting operations of:

for the third volume of the multiple volumes: selecting a size associated with the third volume, the size associated with the third volume being greater than an amount of storage space actually associated with the third volume.

39. (New) An interface as in claim 30, wherein reconfiguring the volume includes modifying a size parameter identifying available storage space in the storage system associated with the volume; and wherein the reconfiguring occurs in response to detecting a request to access the storage system and the request requires that the volume be of a minimum size so that the access can be carried out.

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40. (New) An interface supporting access to a volume in a storage system, the interface comprising:

a processor;

a memory unit that stores instructions associated with an application executed by the processor, the processor supporting operations of:

utilizing a volume interface to enable the at least one computer to access the volume in the storage system;

via the volume interface, keeping track of a corresponding size associated with the volume as well as corresponding storage devices in the storage system associated with the volume; and

providing an appearance to the at least one computer that the corresponding size of the volume is different than an amount of storage space actually provided by the corresponding storage devices in the storage system associated with the volume.

41. (New) An interface as in claim 40, wherein providing the appearance includes providing the appearance to the at least one computer that the size of the volume is larger than the amount of storage space actually provided by the corresponding storage devices in the storage system which are associated with the volume.

42. (New) An interface as in claim 40 further supporting operations of:

without interrupting an application executed by the at least one computer, allocating more storage space in the storage system to the volume as the application executed by at least one computer consumes the amount of storage space in the storage system actually associated with the volume.

43. (New) An interface as in claim 42, wherein allocating more storage space to the volume occurs in response to detecting that an available amount of free storage space associated with the volume crosses a threshold.

44. (New) An interface as in claim 40 further supporting operations of:  
for different usage periods, modifying the amount of storage space  
actually provided by the corresponding storage devices in the storage system  
associated with the volume in response to a usage trend analysis.
45. (New) An interface as in claim 44 further supporting operations of:  
maintaining the corresponding size associated with the volume to be a  
substantially fixed amount more than an actual amount of storage associated  
with the volume.
46. (New) An interface as in claim 44 further supporting operations of:  
providing write overflow protection to the volume by maintaining the  
corresponding size associated with the volume to be less than an actual amount  
of storage space in the storage system associated with the volume.
47. (New) An interface as in claim 46 further supporting operations of:  
in response to detecting that the volume stores more data than indicated  
by the corresponding size associated with the volume, initiating a reconfiguration  
process to add more storage space in the storage system for use by the volume.
48. (New) An interface supporting access to a storage system, the interface  
comprising:
  - a processor;
  - a memory unit that stores instructions associated with an application  
executed by the processor, the processor supporting operations of:  
maintaining a plurality of parameters associated with a volume in the storage  
system;
  - utilizing a first parameter of the plurality of parameters to track a  
corresponding size associated with the volume and a second parameter to track

corresponding storage devices in the storage system associated with the volume; and

via use of the first parameter and second parameter, providing an appearance to a set of computers that the corresponding size of the volume is zero while, simultaneously, there is no storage space and no storage devices in the storage system associated with the volume.

49. (New) An interface as in claim 48, wherein providing the appearance includes:

providing the appearance to the set of computers while a given computer running a backup application has access to the volume stored in the storage system.

50. (New) An interface as in claim 49 further supporting operations of:

during periods when the backup application in the given computer is not in use, modifying the second parameter to remove, from the volume, associations to storage devices in the storage system.

51. (New) An interface as in claim 49 further supporting operations of:

during a time when the back-up application in the given computer is in use, modifying the second parameter to add, to the volume, associations to storage devices in the storage system.

52. (New) An interface as in claim 51 further supporting operations of:

varying an amount of storage space associated with the backup volume during times when the backup volume is in use, the amount of storage space varying depending on portions of the storage system to be backed up.

53. (New) An interface as in claim 48 further supporting operations of:

to support utilizing the volume as a backup volume, coordinating with a backup application executing on a given computer of the set of computers to:

- a.) via modifications to the second parameter, associate portions of storage space from the storage system to the volume;
- b.) enable the backup application to backup the volume to another storage system; and
- c.) via modifications to the second parameter, disassociate the portions of storage space in the storage system from the volume.

54. (New) An interface as in claim 53 further supporting operations of: repeating steps a, b, and c to support backup of each of multiple, different portions of storage space in the storage system.

55. (New) A computer program product including a computer-readable medium having instructions stored thereon for processing data information, such that the instructions, when carried out by a processing device, enable the processing device to perform the steps of:

enabling at least one computer to access a volume in a storage system;  
keeping track of a corresponding size associated with the volume as well as corresponding storage devices in the storage system associated with the volume; and

providing an appearance to the at least one computer that the corresponding size of the volume is different than an amount of storage space actually provided by the corresponding storage devices in the storage system associated with the volume.

56. (New) An access interface associated with a storage system, the access interface providing:

means for enabling at least one computer to access a volume in a storage system;

means for keeping track of a corresponding size associated with the volume as well as corresponding storage devices in the storage system associated with the volume; and

means for providing an appearance to the at least one computer that the corresponding size of the volume is different than an amount of storage space actually provided by the corresponding storage devices in the storage system associated with the volume.

57. (New) A computer program product including a computer-readable medium having instructions stored thereon for processing data information, such that the instructions, when carried out by a processing device, enable the processing device to perform the steps of:

maintaining a plurality of parameters associated with a volume in the storage system;

utilizing a first parameter of the plurality of parameters to track a corresponding size associated with the volume; and

providing an appearance to the at least one computer that the corresponding size of the volume is greater than zero even though there is no storage space in the storage system associated with the volume.

58. (New) An access interface associated with a storage system, the access interface providing:

means for maintaining a plurality of parameters associated with a volume in the storage system;

means for utilizing a first parameter of the plurality of parameters to track a corresponding size associated with the volume; and

means for providing an appearance to the at least one computer that the corresponding size of the volume is greater than zero even though there is no storage space in the storage system associated with the volume.